Electrotrawling for brown shrimp: short-term effects on various adult fish species

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Electric pulses in fishing gear are increasingly used in the North Sea and are considered a promising alternative to ameliorate the sustainability of demersal trawl fisheries. The electrotrawl for brown shrimp employing low frequency pulsed direct current (PDC) selectively induces a startle response in shrimp engendering decreased environmental impact and reduced by-catch. Prior to commercially introducing this fishing technique, data on its impact on marine organisms are crucial. The aim of this study was to evaluate the short-term effects of this pulse used for electrotrawling for brown shrimp on five marine fish species inhabiting shrimp fishery areas. For this purpose, 25 European plaice, 30 Dover sole, 20 Atlantic cod, 19 bull-rout and 20 armed bullhead were exposed to the shrimp pulse for five seconds. Before, during and till 20 minutes following exposure, the behaviour of the fish was monitored. Twenty-four hours post-exposure, all fish were sacrificed, inspected and samples for histological analysis were taken from the gills, dorsal muscle and internal organs. To investigate possible spinal injuries radiographs were taken. Behavioural responses were variable and species dependent. Recovery was rapid for all exposed fish regardless of species. Roundfish species, cod in particular, were displaying more active and fast swimming activity during exposure. The majority of flatfish showed only minor reactions and remained close to the bottom throughout the observation period. However, 15% of the exposed sole actively swam upwards during exposure. Mild multifocal petechial haemorrhages on the tail were equally present in exposed and control individuals of plaice. In five exposed animals, two plaice, one sole and two bull-routs, a focal small haemorrhage between muscle fibers was found, which was not encountered in control animals. In conclusion, under the circumstances as adopted in this study, the electrical field seemed to have only limited immediate impact on the exposed animals.